



# **Local Hazard Mitigation Plan ANNEX**

## **City of Foster City**

### **Introduction**

The City of Foster City is a small-sized city in San Mateo County, California. Foster City, incorporated in 1971, is situated on the San Francisco Peninsula midway between San Francisco and San Jose. The municipality of Foster City covers 4 sq. miles. The City has a population of 28,803 people, based on the 2000 census<sup>1</sup>. Last Year, the City's total budget fund was \$52,911,012. The City has a staff of 217 full-time employees and provides both Fire and Police services to its residents.

### **The Planning Process**

This process of preparing this plan was familiar to the City of Foster City. The City has a Safety Element to its General Plan, last updated in October 1995, which includes a discussion of fire, earthquake, flooding, and landslide hazards. In addition, the City routinely enforces the requirements of the California Environmental Quality Act (CEQA), which, since 1988, have required mitigation for identified natural hazards. The City's effort has focused on building on these pre-existing programs and identifying gaps that may lead to disaster vulnerabilities in order to work on ways to address these risks through mitigation.

Many of the activities conducted by the City were fed into the planning process for the multi-jurisdictional plan. The City participated in various ABAG workshops and meetings, including the general "kick-off" meeting. In addition, the City has provided written and oral comments on the multi-jurisdictional plan. Finally, the City provided information on facilities that are viewed as "critical" to ABAG.

Contact was made with key City staff to identify and prioritize mitigation strategies appropriate for the City. The departments involved included the City Manager's Office, Administrative Services, Fire Department, Police Department, Community Development, and Public Works. The general priorities and appropriate City departments were identified during these meetings and telephone discussions. The City placed the DRAFT Hazard Mitigation Plan, with strategies prioritized and selected by City staff, on its website, providing opportunity for the public to comment. The resolution adopting the plan and strategies was approved by the City Council on September 19, 2005. The mitigation strategies will become an implementation appendix to this Safety Element.

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<sup>1</sup> For complete Census information on this city, see <http://www.bayareacensus.ca.gov/>.

## Hazard and Risk Assessment

The ABAG multi-jurisdictional Local Hazard Mitigation Plan, to which this is an Annex, lists nine hazards that impact the Bay Area, five related to earthquakes (faulting, shaking, earthquake-induced landslides, liquefaction, and tsunamis) and four related to weather (flooding, landslides, wildfires, and drought). These hazards also impact the City of Foster City, except for surface faulting. Surface faulting is not a hazard in the City of Foster City because no active faults are located in the City.

While the City has undertaken a number of general hazard mapping activities since the first Safety Element was prepared by the City, Most of these mapping efforts are less detailed and not as current as those shown on the ABAG website at <http://quake.abag.ca.gov/mitigation/>. There are two hazards, however, where Foster City data is more detailed than that on the ABAG websites.

**Liquefaction** - G&E Engineering Systems prepared Report 54.01.03 for the Bay Area Water Users Association in 2002. (See attachment: "Impact of Earthquakes on BAWUA Customers" Section 3.3 by G&E Engineering Systems Inc., February 22, 2002) The authors note that, in preparing the soils for Foster City, reasonably well compacted soils were placed for the top 5 feet. Below about 10 feet, it is unlikely that there was much done in terms of densification of the then-existing land mass. In addition, the water table throughout Foster City is fairly high, likely within 10 feet of the current surface. The evidence of some limited liquefaction in the 1989 Loma Prieta earthquake in the Foster City area confirms that there are at least locally some layered loose to medium dense sand layers underneath Foster City. Given the moderate levels of shaking and limited duration of shaking in the 1989 Loma Prieta earthquake as compared to what is likely to happen under a large M 7.9 San Andreas event, it is reasonable to assume that for the San Andreas M 7.9 scenario earthquake, liquefaction will occur in the Foster City area in a much more widespread basis than was observed in the 1989 earthquake.

The "very high" liquefaction susceptibility classification shown on the map on the ABAG website suggests that the soils of Foster City are just as susceptible as those in the San Francisco Marina; Alameda Naval Base, south shore of Alameda Island, etc. The good degree of compaction of the top layers of soil should limit liquefaction to mostly deeper layers. Given these issues, for purposes of this Annex, it can be assumed that the actual liquefaction susceptibility of soils under Foster City is in the range of "low" to "very high". Further work would be needed to better quantify the regional liquefaction susceptibility. Lacking better supplemental information, it is prudent to plan for the worst case (very high susceptibility), with recognition that actual impacts might be fewer. Thus, the priorities for liquefaction hazard mitigation assume "very high" liquefaction susceptibility.

While the U.S. Geological Survey maps showing liquefaction susceptibility incorporated into ABAG's multi-jurisdictional Local Hazard Mitigation Plan suggest that the soils of Foster City range between "low" to "very high," the city has established mitigation strategies to reduce the liquefaction affects caused by an earthquake through the following factors:

- The City of Foster City was built on engineered landfill. The landfill was engineered between 1963 and 1968.

- When constructing buildings within the city, a soils analysis report is required to determine the appropriate foundation for the structure.
- Any building (4) stories or above, and with a soil analysis report are required to be built on a pile-supported foundation.
- All critical structures within the city have had a soil analysis report completed, with the appropriate foundation being constructed.

On August 15, 2005, city staff will be meeting with Anne Rosinski, an Engineering Geologist with the California Geologic Survey Agency - Seismic Hazard Mapping Program Division. This meeting is intended to start the review process of the city's geotechnical logs and soil reports that will determine the impact of landslides and liquefaction to the city. When completed, the information gathered will be used to update the City of Foster City maps shown on the ABAG web site.

**Wildland-Urban-Interface Fire Threat** – The ABAG website shows a map of WUI Fire Threat based on work by the California Department of Forestry indicating that the Foster City area is largely in one of these areas. Given the distance between the grass and woodland areas of the Peninsula and the Bay in Foster City, the most likely source of this hazard would be fire embers falling on old shake roofs and causing a secondary fire. Based on this, and other concerns, in November of 1986, Foster City adopted Ordinance 329, Section 15.24.130 which requires that only Class C or better roofing material is used for new construction and re-roof projects. As of mid-2005, 80% of the roofs in Foster City have fire-resistant roofing. Thus, the cause of Foster City being mapped as having this hazard is being fully mitigated.

As of August 3, 2005 – The authors of the Wildland-Urban-Interface Threat Map at the California Department of Forestry and Fire Protection have determined that an error was made in designating the City of Foster City as having a "Wildland-Urban-Interface Threat." By the end of August 2005, The California Department of Forestry and Fire Protection will be providing a letter documenting that the City of Foster City is outside of the Wildland-Urban-Interface Threat Area.

Information on disasters declared in San Mateo County is at <http://quake.abag.ca.gov/mitigation/disaster-history.html>.

The City examined the hazard exposure of City urban land based on the information on ABAG's website at <http://quake.abag.ca.gov/mitigation/pickdbh2.html>. Of the 2,265 urban acres in the City, the following hazardous exposures were identified:

- ◆ Earthquake faulting – No active faults run within the city so rupture of a fault is not a direct concern.
- ◆ Earthquake shaking – 1,976 acres are in the highest two categories of shaking potential.
- ◆ Earthquake-induced landslides – the California Geological Survey has not completed mapping of this hazard in the City of Foster City.

- ◆ Earthquake liquefaction – while 1,993 acres have been mapped as being in areas of high or very high liquefaction susceptibility, as noted above, the hazard likely varies from “very high” to “low.”
- ◆ Tsunamis – While tsunamis may be a hazard in the City of Foster City, the mapping of the inundation area has not been completed at this time.
- ◆ Flooding – There are no areas subject to flooding.
- ◆ Landslides – There are no areas subject to landslides.
- ◆ Wildfires – There are no areas are subject to wildfire threat. While the website indicates that a substantial portion of the City is within areas of wildland-urban interface fire threat, as noted above, in November of 1986, Foster City adopted Ordinance 329, Section 15.24.130 which requires that only Class C or better roofing material is used for new construction and re-roof projects.
- ◆ Dam Inundation – 2,208 acres are subject to dam inundation.
- ◆ Drought – all 2,265 acres are subject to drought.

The City also examined the hazard exposure of infrastructure based on the information on ABAG’s website at <http://quake.abag.ca.gov/mitigation/pickdbh2.html>. Of the 85 miles of roadway and 73 miles of pipelines under roads in the City, the following hazardous exposures were identified:

- ◆ Earthquake faulting – No active faults run within the city so rupture of a fault is not a direct concern.
- ◆ Earthquake shaking – 73 miles of roadway and 63 miles of pipelines under roads are in the two highest categories of shaking potential.
- ◆ Earthquake-induced landslides – the California Geological Survey has not completed mapping of this hazard in the City of Foster City.
- ◆ Earthquake liquefaction – 69 miles of roadway and 66 miles of pipelines under roads are mapped as in areas of high or very high liquefaction susceptibility. The level of hazard these roads are exposed to varies, as noted earlier. Foster City has worked to mitigate the hazard of liquefaction to its pipeline and pumping station systems.
- ◆ Tsunamis – While tsunamis may be a hazard in the City of Foster City, the mapping of the inundation area has not been completed at this time.
- ◆ Flooding – No infrastructure is within flood areas.
- ◆ Landslides – No infrastructure is within landslide areas.
- ◆ Wildfires – No infrastructure is within wildfire areas. While other areas are in areas with a potential wildland-urban-interface fire threat, Foster City is working to eliminate this hazard.
- ◆ Dam Inundation – 77 miles of roadway and 73 miles of pipelines under roads are subject to dam inundation.
- ◆ Drought – is not a hazard for roadways.

Finally, the City examined the hazard exposure of critical health care facilities, schools, and city-owned buildings based on the information on ABAG’s website at <http://quake.abag.ca.gov/mitigation/pickcrit.html>. Of the critical facilities in the City, the following hazardous exposures were identified:

- ◆ Earthquake faulting – No active faults run within the city so rupture of a fault is not a direct concern.
- ◆ Earthquake shaking – One health care facility, six schools, 59 critical facilities and 11 bridges and interchanges are in the two highest categories of shaking potential.
- ◆ Earthquake-induced landslides – the California Geological Survey has not completed mapping of this hazard in the City of Foster City.
- ◆ Earthquake liquefaction – One health care facility, six schools, 62 critical facilities and seven bridges and interchanges are in the two highest categories of earthquake liquefaction. As indicated in the report cited earlier, Foster City would need to perform further geotechnical analyses to further evaluate the actual liquefaction hazard underneath these specific facilities.
- ◆ Tsunamis – While tsunamis may be a hazard in the City of Foster City, the mapping of the inundation area has not been completed at this time.
- ◆ Flooding – No critical facilities are within flood areas.
- ◆ Landslides – No critical facilities are within landslide areas.
- ◆ Wildfires – No critical facilities are within wildfire areas. While the website indicates that a substantial portion of the City is within areas of wildland-urban interface fire threat, as noted above, 100% of the critical facilities now have fire-resistant roofing.
- ◆ Dam Inundation – One health care facility, six schools, 67 critical facilities and 11 bridges and interchanges are within a dam inundation area.
- ◆ Drought – Drought will not affect city buildings directly. However, the city does operate a water-supply distribution system.

The City plans to work with ABAG during 2005 to improve the risk assessment information being compiled by ABAG by providing information on un-reinforced masonry buildings and soft-story apartments located in the City.

Drought, though a potential problem in the City, is not fully assessed. The City will work with ABAG and various water supply agencies on this issue.

The City plans to work with ABAG to develop specific information about the kind and level of damage to buildings, infrastructure, and critical facilities which might result from any of the hazards previously noted. The ABAG Annex states that ABAG will be doing this work in 2005 through early 2006.

As these impacts are not fully developed, the City has reviewed, identified, and then ranked the hazards based on past disasters and expected future impacts. The conclusion is that earthquake shaking, earthquake liquefaction and dam inundation pose the most significant risk for potential loss.

## Mitigation Activities and Priorities

As a participant in the ABAG multi-jurisdictional planning process, Foster City staff helped in the development and review of the comprehensive list of mitigation strategies in the overall multi-jurisdictional plan. The list was discussed with the Fire Department, Police Department, Building Department, Public Works, and Planning Department on June 6, 2005. At that time, all of the mitigation strategies were reviewed. The tentative decision on priority was made based on a variety of criteria, not simply on an economic cost-benefit analysis. These criteria include being technically and administratively feasible, politically acceptable, socially appropriate, legal, economically sound, and not harmful to the environment or our heritage.

Over time, we are committed to developing better hazard and risk information to use in making those trade-offs. We are not trying to create a disaster-proof region, but a disaster-resistant one. In addition, several of the strategies are existing City programs.

Subsequently the draft priorities were provided to the City Council in September 2005. The public was provided with an opportunity to comment on the DRAFT priorities via our website. The final strategies (as shown in the attached Table) will become an *Implementation Appendix* to the City's *Safety Element*.

Additionally, the City examined the hazard exposure information to City-owned critical facilities supplied by ABAG as well as the Risk Assessments available on ABAG's website specific to the City of Foster City.

## The Plan Maintenance and Update Process

The Foster City Fire Department will ensure that **monitoring** of this Annex will occur. The plan will be monitored on an on-going basis. However, the major disasters affecting our community, legal changes, notices from ABAG as the lead agency in this process, and other triggers will be used. Finally, the Annex will be a discussion item on the agenda of the meeting of City department heads at least once a year in April. At that meeting, the department heads will focus on **evaluating** the Annex in light of technological and political changes during the past year or other significant events. This group will be responsible for determining if the plan should be updated.

The City of Foster City is committed to reviewing and updating this plan annex at least once every five years, as required by the Disaster Mitigation Act of 2000. The Fire Chief will contact ABAG four years after this plan is approved to ensure that ABAG will undertake the plan update process. If so, the City again intends to participate in the multi-jurisdictional plan. If ABAG is unwilling or unable to act as the lead agency in the multi-jurisdictional effort, other agencies will be contacted, including the County's Office of Emergency Services. Counties should then work together to identify another regional forum for developing a multi-jurisdictional plan.

The *public* will continue to be involved whenever the plan is updated, and as appropriate, during the monitoring and evaluation process. Prior to adoption of updates, the City will provide the opportunity for the public to comment on the updates. A public notice will be posted prior to the meeting to announce the comment period and meeting logistics.

**Attachments (1)**

“Impact of Earthquakes on BAWUA Customers” Section 3.3 by G&E Engineering Systems Inc., February 22, 2002

# **Impact of Earthquakes on BAWUA Customers**

## *Foster City (Estero) Report*

*Prepared for:  
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G&E Report 54.01.03, Revision 0  
February 22, 2002



### **3.3 Establishing Liquefaction Susceptibility Hazard**

Figure 3-2 was established based on mapping by Knudson et al [2000]. The general procedure was as follows:

- Foster City was mapped at a scale of 1:24000.
- Reviews were made of previous available maps, interpretation of landforms through analysis of topographic contours on 7.5 minute quadrangles; inspection of stereo-paired aerial photographs; review of soil survey maps; and limited field reconnaissance.
- It is felt that the data in Figure 3-2 can be improved with further study, but for the current effort, is a reasonable description of the liquefaction susceptibility of the area.

A review of the basis for the map in Figure 3-2 suggests that the authors of that map may not have had access to the detail soil logs developed by Dames in Moore, circa 1960, which are summarized in Figure 3-3. Given these differences, for this study we make the following observations:

- In preparing the soils for Foster City, reasonably well compacted soils were placed for the top 5 feet. Below about 10 feet, it is unlikely that there was much done in terms of densification of the then-existing land mass.
- The water table throughout Foster City is fairly high, likely within 10 feet of the current surface.
- In the 1989 Loma Prieta earthquake, there was surface evidence of liquefaction in at least three locations in Foster City. The level of ground shaking in Foster City in that earthquake was likely in the  $PGA = 0.06g$  to  $0.20g$  range. The duration of strong ground shaking ( $PGA$  over  $0.05g$ ) was likely in the 6 to 8 second range.
- From Figure 3-3, it appears that most of Brewer Island (now Foster City) was underlain by about 10 to 20 feet of Bay Mud's, followed by an additional layer of 10 to 20 feet of sands and silty sands. During the development of modern Foster City, the top several feet of the existing Bay Mud's were replaced with soils (native area or imported) compacted to about 85%.
- The evidence of some limited liquefaction in the 1989 Loma Prieta earthquake in the Foster City area confirms that there are at least locally some layered loose to medium dense sand layers underneath Foster City.
- Given the moderate levels of shaking and limited duration of shaking in the 1989 Loma Prieta earthquake as compared to what is likely to happen under a large M 7.9 San

- Andreas event, it is reasonable to assume that for the San Andreas M 7.9 scenario earthquake, liquefaction will occur in the Foster City area in a much more widespread basis than was observed in the 1989 earthquake.

The "very high" liquefaction susceptibility classification suggested in Figure 3-2 suggests that the soils of Foster City are just as susceptible as those in the San Francisco Marina; Alameda Naval Base, south shore of Alameda Island, etc. For purposes of this project, this classification seems to be possibly too severe, for the following reasons:

- There was some limited liquefaction in the Foster City area in 1989. But, the amount was less severe than seen in other areas of the Bay Area characterized as having "very high" liquefaction susceptibility.
- The good degree of compaction of the top layers of soil should limit liquefaction to mostly deeper layers.
- The impact of liquefaction on deeper soil layers is not so severe on near-surface level structures such as pipelines, as the settlements will tend to have more limited differential settlements.
- Foster City staff indicate that the existing pipe network suffers only about 5 pipe breaks / leaks per year, which is not all that much, and suggests that there is not major ongoing relative soil movements.

Given these issues, for purposes of this report, we assume that the actual liquefaction susceptibility of soils under Foster City is in the range of "low" to "very high". Further work would be needed to better quantify the regional liquefaction susceptibility. Lacking better supplemental information, it would be prudent to plan for the worst case (very high susceptibility), with recognition that actual impacts might be fewer.